

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|-------|------|---|-----------------|------------------|---------|------------------|
| L1 | 1711 | (hole or opening or recess or aperture or trench or via) same (liner with oxide) | US-PGPUB; USPAT | OR | ON | 2005/01/13 09:25 |
| L2 | 1098 | 1 and (resist or photoresist) | US-PGPUB; USPAT | OR | ON | 2005/01/13 09:25 |
| L3 | 642 | 2 and (plurality or multi or multiple or double or triple) | US-PGPUB; USPAT | OR | ON | 2005/01/13 09:27 |
| L4 | 457 | 3 and (trench near3 isolation) | US-PGPUB; USPAT | OR | ON | 2005/01/13 09:28 |
| L5 | 437 | 4 and @ad<"20040106" | US-PGPUB; USPAT | OR | ON | 2005/01/13 09:28 |
| L6 | 436 | 5 and (etching or removing or remove or etch) | US-PGPUB; USPAT | OR | ON | 2005/01/13 10:24 |
| L7 | 222 | 6 and TEOS | US-PGPUB; USPAT | OR | ON | 2005/01/13 11:15 |
| L8 | 1238 | (trench near3 isolation) and TEOS and BPSG and nitride | US-PGPUB; USPAT | OR | ON | 2005/01/13 11:16 |
| L9 | 834 | 8 and (resist or photoresist) and (hole or opening or aperture or recess) and (etch or etching or remove or removing) | US-PGPUB; USPAT | OR | ON | 2005/01/13 11:17 |
| L10 | 801 | 9 and @ad<"20040106" | US-PGPUB; USPAT | OR | ON | 2005/01/13 11:17 |

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|-------|------|---|-----------------|------------------|---------|------------------|
| L1 | 155 | (hole or opening or recess or aperture or trench or via) same (liner with TEOS) | US-PGPUB; USPAT | OR | ON | 2005/01/13 13:49 |
| L2 | 125 | 1 and (trench near3 isolation) and @ad<"20040106" | US-PGPUB; USPAT | OR | ON | 2005/01/13 13:50 |

US-PAT-NO: 6825097

DOCUMENT-IDENTIFIER: US 6825097 B2

TITLE: Triple oxide fill for trench isolation

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Detailed Description Text - DETX (8):

The inventors have found that both types of voids can be avoided if a preliminary low density oxide liner 152 is deposited, having a thickness in this example of between 25 nm to 45 nm. The actual thickness required is dependent upon the deposition technique used, the resulting liner density, and the degree of recess at the bottom corner of the starting trench. A thickness of about 15 nm greater than the thickness of liner 112 gives sufficient filling margin in the case of LPCVD. When the second liner is deposited by RTCVD, a thickness of about 30 nm greater than the thickness of liner 112 is preferred. Those skilled in the art will readily be able to determine a suitable thickness to fill in their non-planarity. Examples of preliminary liner deposition techniques include LPCVD TEOS (TetraEthyl OrthoSilicate) and RTCVD oxide. Unexpectedly, for these techniques the thin preliminary liner is only moderately conformal and fills in the recesses or negative trench angles 114, leaving a face that is substantially planar compared with the face left by liner 112 of FIG. 2. In the case of LPCVD TEOS, liner 152 is deposited at a temperature in the range of 620-700 degrees C., with 620 degrees preferred, a chemistry of tetraethyl orthosilicate and pressure range of 200 to 1000 mTorr, with 1000 mTorr preferred. In the case of RTCVD, the deposition is preferably done at a temperature in the range of 700 to 775 degrees C., with 775 degrees C. preferred, a chemistry of N.sub.2 O and SiH.sub.4 and pressure range of 15 to 75 Torr, with 15 Torr preferred.